Chapter 7

Towards a Post-Implementation Evaluation Framework of Outpatient Electronic Drug Prescribing

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ABSTRACT

The adoption of electronic drug prescribing (ePrescribing) systems has been largely discussed in scientific literature. Yet post-implementation evaluations of these systems are still in short supply. At a time when large investments are being made throughout the world in health information systems and technologies, under pressure for cost-containment, evidence on which systems provide the largest net benefits is required. In this chapter, the authors start by reviewing the literature on the costs and benefits of outpatient ePrescribing systems and find that the evidence is scattered. There is a general consensus that ePrescribing is beneficial, although few studies quantify the net benefits of specific systems. The review also shows that the evaluation of ePrescribing systems is complex and that most studies share limitations associated with the evaluation of other health information technologies and systems. The authors propose an evidence-based framework to inform post-implementation evaluations of outpatient ePrescribing systems and to improve the quality and comparability of studies in the area.

INTRODUCTION

The challenges facing modern healthcare systems are considerable (Department of Health, 2008; Lerberghe, 2008). On the demand side, increased pressure on healthcare delivery is partly explained by ageing populations, increased life expectancy, increased levels of co-morbidity from chronic conditions, and rising expectations on the level of health services provided. On the supply side,
healthcare delivery is increasingly complex, given rapid technological developments that introduce high pressure on cost control as well. Furthermore, although life expectancy improvements have been observed in developed countries, policies in these countries have not been effective in decreasing inequalities both in the access to care and in health outcomes. These inequalities still prevail and have even increased in some countries (Lerberghe, 2008).

Within this context, policy-makers and managers are concerned with the sustainability of healthcare funding and how to best apply scarce resources. In order to make informed decisions, policy-makers and managers need to access information on the costs and benefits related to the adoption and dissemination of healthcare technologies. Although there have been considerable investments in health information systems and technologies in recent years, there is evidence that the use of these systems in general, and of electronic drug prescribing (ePrescribing) systems in particular, is still very limited (Friedman, Schueth, & Bell, 2009). In order to understand why there has been a limited adoption of ePrescribing systems, this study starts by reviewing the literature on the costs and benefits related to ePrescribing systems. Based on the results from this review, we propose a framework to evaluate implementations of ePrescribing systems in the outpatient setting.

This chapter is organized as follows: the first section provides background information about the role of prescribing systems in the healthcare system, the basics of ePrescribing, and the diffusion of ePrescribing systems. The second section reviews evidence on the benefits and costs of ePrescribing and the third section introduces the framework. The chapter ends with a reflection on future research directions and with concluding remarks.

**BACKGROUND**

**The Context of Prescribing Systems**

Medications play a crucial role in healthcare. When drugs are available, affordable, of good quality and used as intended, they offer a simple and cost-effective answer to many health problems (Hodgkin, Carandang, Fresle, & Hogerzeil, 2001). A considerable portion of total healthcare expenditure is devoted to medications. Total expenditure in pharmaceuticals across countries of the Organisation for Economic Cooperation and Development (OECD) reached $650 billion in 2007, representing around 15 percent of total health expenditure (Organisation for Economic Cooperation and Development, 2009). According to the same source, over the last ten years, average per capita spending on pharmaceuticals has risen by almost 50 percent in real terms. Providers in the United States (US) write 1.5 billion prescriptions every year at an annual cost of $286.5 billion, and this amount is expected to double over the next ten years (Stenner, Chen, & Johnson, 2010).

The prescribing process is vulnerable to errors. These can occur at several stages: the time of ordering, when an order is transcribed, when the medication is dispensed, when it is administered, or when it is consumed. It has been estimated that 60 percent of serious errors occur at the ordering and transcription stages (Roberts et al., 2010). These errors can lead to adverse drug events (ADEs), i.e. injuries due to medications (Abelson, Connelly, Klee, Maag, & Smith, 2001). Every year, in the US alone, 8.8 million ADEs occur, causing 1 out of 131 deaths in the ambulatory setting (eHealth Initiative, 2004). In 1995, the costs of mortality and morbidity associated with medication problems were estimated at over $76.6 billion per year, accounting for 8 percent of total healthcare spending (Johnson & Bootman, 1995). These numbers were updated in 2001, resulting in a new estimate of $177.4 billion (Ernst & Grizzle, 2001). These numbers highlight the need for strategies to pre-